

HYDROTHERAPEUTICS.

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REPRINTED FROM PROCEEDINGS OF
AMERICAN MEDICO-PSYCHOLOGICAL ASSOCIATION,
ST. LOUIS, MO., MAY, 1904.

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The use of water in the treatment of disease has received a fresh impetus in this country in recent years largely through the efforts of Dr. Simon Baruch, and hydrotherapeutic apparatus has been and is still being installed in many private sanatoria and in public hospitals for nervous and mental diseases. Whether it is a fashion, a fad which in time will disappear, remains to be seen. It must be remembered, however, that hydrotherapy has been used much more extensively in continental Europe than in this country and that the use of heat and cold, in some form or other, in the treatment of disease, is as old as the practice of medicine. The permanence of the present movement will depend, partly on its value as demonstrated by many careful observers, but perhaps quite as much on the accuracy with which it is prescribed by those who attempt to use it. Each one must acquire for himself a knowledge of the proper use of this agency without which he employs it in a routine way, without a proper selection of the patients or adaptation to the individual of the procedure employed.

This report is a record of the experience of the McLean Hospital where hydrotherapy has been actively, though more or less empirically, used since the spring of '99.

For a few months, previous to the installation of a regular apparatus in the bathrooms of the gymnasium for women in June, '99, such methods were employed as are adapted to the bedroom or the ordinary bathroom, viz., cold ablutions; the dry pack (taking the place of the hot air bath) followed by the half bath, cold affusions, or the dripping sheet; and cold packs. In all cases the temperature of the water at first was 85° and

Read before the American Medico-Psychological Association at the Annual Meeting, held in St. Louis, Mo., May, 1905.

was gradually reduced day by day to 60° F. By the use of these one can obtain much of the beneficial effect of hydrotherapy without complicated and expensive apparatus. Since installation of the apparatus the following baths have been given in addition to those above mentioned with these limits of temperature, duration and pressure:

Hot air bath, 180°-190°, 3-10 minutes.

Circular douche, 100°-90°, $\frac{1}{2}$ to 1 minute, 15 to 38 lbs.

Fan douche, 85°-56°, 10 to 30 seconds, 15 to 30 lbs.

Jet douche, 75°-56°, 10 to 30 seconds, 15 to 30 lbs.

Scotch douche (either fan or jet) 110° alternating with 60°, $\frac{1}{2}$ to 3 minutes, 15 to 30 lbs.

An attempt has been made to select from these, or to make combinations of, what would be most beneficial for the individual patient. The effect desired has been tonic or stimulating and careful attention has been paid to obtaining a good reaction, that is, a comparatively permanent return of the blood to the surface vessels. The dry pack or hot air bath is used first in any combination, dilating the surface vessels. The immediately subsequent application of cool or cold water causes them to contract, and there is a diminished blood supply in the skin. The impact of the water delivered under pressure tends to aid its return by reflex stimulation of the heart. There is no doubt that cold applications to a large part of the surface of the body at once increases the amount of blood in the internal organs. If the heart is strong enough immediately to return this blood to the surface, there has been a healthful flushing of these organs and theoretically an increased activity. If a reaction is not established, a dangerous congestion may result. The problem is to adapt the temperature, time and pressure to the strength of the individual that the reaction may be as perfect as possible. People differ in regard to their ability to respond and there is also a variation in the same person at different times according to his condition, so that even healthy people should use caution in taking these baths when they are tired. Cases of chronic tire require the most careful supervision in order to avoid doing them harm. Those who are physically strong usually experience a sense of vigor and well-being after the most active measures, which feeling may last throughout the day, or in some be followed by drowsi-

ness in an hour or two. The neurasthenic, if the bath is too vigorous, complains of being tired or completely exhausted, and will often lie down for an hour or two, the testimony being something like this: "They use me all up," "I was all tired out," "I could scarcely get back to my room," etc. Effort was made at first to obviate this feeling of exhaustion by giving the baths less frequently, perhaps three times a week, but it has been found better to raise the temperature, lower the pressure, and above all to shorten the time, continuing the baths daily. Considerable weight should be given to the testimony of patients with regard to their feelings after the baths, and if they complain of exhaustion, milder measures should be prescribed. The almost universal testimony of neurasthenics seems to conflict with the claim that these baths increase the capacity for work. Baruch says that cold applications increase, and warm decrease it. This statement is based upon the ergograph experiments of Vinaj and Maggiori in '92 and '93, who give fatigue curves showing a wonderful increase of work done after a cold plunge at 50° for 15 seconds, a gradually cooled bath at 96° to 68° for five minutes, a wet pack of two hours followed by a cold dip, a rain douche (50°), and a Scotch douche (98° and 50°),—following all these there is a great increase in working capacity; after the second it is increased three-fold. Vinaj and Maggiori show also by experiments that cold applications restore the working capacity after fatigue. It is claimed that warm applications also have the effect of increasing the capacity for work, and of restoring it after fatigue, if they are combined with some mechanical irritation, like friction or the impact of water delivered under pressure, which counteracts the enervating effects of the temperature. The statement then is that only the uncomplicated, simple, warm applications reduce the capacity for work while all the others increase it, the cold, by virtue of their temperature, the warm, to a less degree in spite of their temperature, the effect of which is overcome by mechanical irritation.

In order to ascertain whether baths as given at the McLean Hospital really increase the capacity for work, four series of experiments have been made on three patients and a nurse, all physically strong men. Each pulled on the ergograph to exhaustion twice with an interval of fifteen minutes, then went

ERGOGRAF EXPERIMENTS.—EFFECT OF BATHS ON CAPACITY FOR WORK.

Case.	1902.	Pull Number.		Total Height.		Pull Number.		Total Height.		Gain or Loss.	Gain or Loss.	
		1st Trial.	2nd Trial.	1st Trial.	2nd Trial.	3rd Trial.	4th Trial.	3rd Trial.	4th Trial.			
I	March 18	56	55	1135	1239	42	44	943	1069	-25	-382	A bath was given between the 2nd and 3rd trials on March 18 and 19. Bath:—Hot air, 180°, 9 minutes (per- spiration); Scotch douche, 106° alternating with 60° for 1 minute, 30 lbs. pressure; fan douche, 60°, 15 sec., 30 lbs. Bath as for case I, between 2nd and 3rd trials on March 50, 22 and 25.
	" 19	43	47	950	1229	44	39	900	868	-7	-330	
	" 22	61	44	1531	1187	57	47	1311	1109	-1	-308	
	" 24	49	39	1193	885	47	40	1138	1122	+4	+102	
	" 29	51	58	1275	1473	65	63	1505	1310	+20	+68	
	April 10	60	55	1458	1550	58	57	1439	1405	=	-143	
II	March 20	47	44	1052	1127	37	35	1023	866	-19	-190	
	" 22	33	33	1063	1246	35	35	1097	1035	-7	-150	
	" 25	35	35	1055	1064	37	35	1050	928	+2	-131	
	" 24	35	39	1114	1103	35	40	1005	1112	+1	-150	
	" 26	36	33	1054	949	38	35	1062	1016	+4	+126	
	April 7	36	38	1126	1112	41	42	1083	1143	+8	+28	
III	April 8	44	43	1356	1334	45	46	1336	1298	+4	-86	Bath between 2nd and 3rd trials on Apr. 23 and 24. Bath:—Hot air, 190°, 5 minutes; cin- lar douche 97° to 80°, 1 min., 28 lbs.; jet douche, 70°, 15 sec., 28 lbs.; fan douche, 60°, 15 sec., 28 lbs.
	" 9	41	43	1147	1160	45	43	1223	1098	+2	+14	
	" 10	38	42	1185	1214	44	43	1236	1200	+7	+27	
	April 23	43	43	1745	1752	43	42	1588	1569	-1	-340	
	" 24	42	42	1716	1631	45	43	1637	1477	+4	-233	
	" 21	44	45	1833	1650	44	38	1604	1500	-7	-259	
IV	" 22	42	43	1876	1801	43	44	1816	1714	+2	-207	Bath as for Case III, between 2nd and 3rd trials on April 23 and 24.
	" 23	51	48	1576	1629	56	58	1754	1664	+15	+413	
	" 24	46	48	1564	1681	59	51	1935	1721	+18	+411	
	" 21	46	48	1667	1593	51	52	1671	1765	+14	+165	
	" 22	46	50	1649	1836	44	52	1546	1736	=	-203	

to the gymnasium for a bath, returned immediately to the laboratory and again pulled to exhaustion twice, with the same interval of time. For purposes of control the same men repeated the experiment on another day in the same way without the bath. As shown by the third and fourth curves there was a slight loss of capacity for work in three cases after the bath and an increase in the fourth; on the days when no bath was given there was sometimes a gain, sometimes a loss. If the results show anything they indicate a lessened capacity after the bath. Certainly they do not show the great increases above mentioned, although the baths given were not essentially different from those of Vinaj and Maggiori.

Observations were made on the variations in pulse rate, respiration and temperature during the various stages of an ordinary bath, which show that they all vary directly with the temperature to which the individual is subjected, with the exception that lowering of the pulse rate by cold applications is somewhat delayed by the mechanical irritation of the impact of the water in the douche, and also that the sudden application of cold douches causes considerable irregularity in the rhythm and depth of respirations, but they both finally drop under the influence of a lower temperature, and they drop much more rapidly than they were raised by heat. The fall in pulse rate is sometimes very sudden,—in one case, in 70 seconds there was a change in the rate of 60 beats; in another 66 in the same time; in a third, 72 in 40 seconds. The duration of the hot air bath was from 6 to 10 minutes; the patient began to perspire in from 2 to 9 minutes; the pulse rate increased to 120 or 130 during the hot air bath, and dropped in some cases to 60 or lower in from 40 seconds to 1 1-3 minutes. The respirations during the hot air bath increased from 5 to 14 a minute, and immediately returned to the normal point after the douches. The temperature taken in the mouth was raised from 2° to 1.2° by a hot air bath (180° - 190°) of from 7 to 15 minutes' duration, the rise varying in different persons and in the same person on different days. It was found to be lowered somewhat immediately after an application of cool or cold water, but its fall was not so rapid as in the case of pulse rate and respiration.

There is a change in the blood pressure under the influence

of hot and cold applications which is rapid and of short duration. It varies inversely with the temperature. Hot applications lower it, cold applications raise it. I have used at different times the instruments of Fitz, Gartner and Riva Rocci. Precautions were taken to eliminate so far as possible other causes of variation such as the time of day, position, exercise, fatigue, and emotional disturbances. All the observations were made on women,—patients and nurses.

Notwithstanding considerable variation in the results, there is no doubt that the pressure falls while the patient is in the hot air bath and quickly rises to the normal again during the subsequent application of cool douches. Below is given a table showing the blood pressure of different persons, or the same persons at different times, before the bath, while the patient is in the hot air cabinet and immediately after the cool douche. Each number, except the lowest, is the average of at least ten observations. This sudden, and, in some cases, material fall of the blood pressure is no doubt the reason why some people faint in the hot air cabinet, and it should be used cautiously with weak neurasthenics and with elderly people, especially those who show an arterio-sclerosis.

BLOOD PRESSURE IN MM. HG.

Before the Bath.	While in Hot-Air Cabinet.		After Douche.
	Average.	Lowest.	
125	117	110	120
123	115	103	122
107	108	103	115
118	113	106	114
114	105	98	114
118	113	112	111
115	106	97	118
116	105	94	116
110	100	95	112
133	118	110	129
118	112	105	125
132	117	106	134
125	100	91	124
125	112	103	124
126	103	93	126
149	127	122	142
138	132	125	143
134	116	108	133
132	120	110	130
126	121	114	134

Considerable importance has been attached by Dr. Baruch to the fact that certain procedures are followed by an increase in the number of red and white cells in the blood taken from the lobe of the ear. A hot air bath of 10 minutes followed by a jet douche of five seconds caused an increase of 700,000 red and 1,500 white cells. A tub bath of 80° for ten minutes was followed by exactly the same increase. This we have been unable to confirm. Dr. Guy G. Fernald of the hospital staff has made many counts in a very careful way before and again at varying intervals after the baths, taking blood from the lobe of the ear, but without any uniformity of result. Sometimes there has been an increase, again a diminution of both red and white cells, sometimes an increase of one and a diminution of the other. There is no doubt that after a cold bath of from 10 to 15 minutes' duration, while the individual is thoroughly chilled, the blood in the surface vessels will contain an increase of cells. This does not show a more active circulation of cells which have been driven out from their hiding places, so to speak (Winternitz). It seems more probable that it is merely a local affair, an irregular distribution of cells and plasma, due to a constriction of the surface capillaries under the influence of cold (Ewing). These capillaries are some of them so small that the cells can only go through singly under normal conditions, and when strongly contracted they may not permit their passage at all, the plasma then running on, leaving many cells stranded. Thus for the time being there is a larger proportion of cells in the blood of the skin. Instead then of causing a more active circulation of cells, the effect is just the opposite in the surface vessels and it is a disadvantage,—a serious one if long continued. All observers agree that it is a temporary affair which disappears within 15 or 20 minutes, or as soon as a reaction is established. Warm baths cause a contrary effect.

I present a few careful observations showing the number of red and white cells before the bath, at the end of the hot air bath, 2 minutes after the douche, and 1½-2½ hours after the bath, with a description of the bath in each case.

Considerable work has been done by various observers to determine the effect of hot and cold baths on tissue changes of the body. While there is some difference in results, most

EFFECT OF BATHS ON THE NUMBER OF RED AND WHITE BLOOD CELLS.

Case.	Time.	Before the Bath.			End of Hot Air Bath.			2 Minutes after Douches.			1½ to 2½ hs. after Bath.			Bath.
		Red.	White.	Ratio.	Red.	White.	Ratio.	Red.	White.	Ratio.	Red.	White.	Ratio.	
I	10 A. M.	4,914,500	9,134	684				4,676,600	7,630	613				Hot Air, 172° 3 m.; circular, 95°-90° 50 sec., 32 lbs.; fan, 75°-60° 30 sec., 32 lbs.
II	"	5,253,000	6,360	826				4,817,000	7,440	648				Hot Air, 186° 8 m.; circular, 95°-90° 45 sec., 20 lbs.; fan, 85°-65° 25 sec., 30 lbs.; jet, 65° 10 sec., 25 lbs.
III	"	4,720,000	9,211	512				4,779,000	8,911	536				Hot Air, 190° 16 m.; circular, 95°-90° 1 m., 32 lbs.; fan, 65° 30 sec., 32 lbs.; jet, 65° 5 sec., 25 lbs.
III	"	4,785,605	10,600	451	5,047,242	8,584	588	4,555,410	8,972	500	4,658,841	7,875	592	Hot Air, 188° 10 m.; circular, 95°-90° 1 m., 35 lbs.; fan, 70° 30 sec., 30 lbs.; jet, 70° 15 sec., 25 lbs.
III	"	4,881,841	8,666	566	4,948,507	9,892	470	4,673,903	10,444	447	4,539,937	10,346	440	Hot Air, 190° 11 m.; circular, 95°-90° 1 m., 35 lbs.; fan, 70°-60° 30 sec., 35 lbs.; jet, 60° 15 sec., 25 lbs.
IV	"	4,375,000	5,995	780	4,322,000	5,477	730	4,189,000	5,694	786				Hot Air, 188° 14 m.; circular, 95°-90° 35 sec., 28 lbs.; fan, 85°-68° 35 sec., 28 lbs.
V	"	4,810,000	7,365	665	4,630,000	9,020	514	4,400,000	9,293	450	4,637,000	8,121	570	Hot Air, 186° 17 m.; circular, 95°-90° 30 sec., 30 lbs.; fan, 70° 30 sec., 30 lbs.; jet, 70° 5 sec., 25 lbs.
V	"	4,674,693	7,300	640	4,406,165	6,298	703	4,172,722	7,138	564	4,123,793	7,249	568	Hot Air, 180° 12 m.; circular, 95°-90° 30 sec., 35 lbs.; fan, 65° 30 sec., 35 lbs.; jet, 65° 5 sec., 25 lbs.
VI	"	4,713,661	9,103	511	5,057,165	8,584	581	4,987,254	7,638	651	4,995,523	7,462	671	Hot Air, 180° 8 m.; circular, 95°-90° 45 sec., 20 lbs.; fan, 70°-60° 25 sec., 30 lbs.
VII	"	5,600,114	5,963	938	5,100,741	5,368	950	5,455,961	6,182	880	5,594,170	8,666	645	Hot Air, 188° 12 m.; circular, 95°-90° 40 sec., 32 lbs.; fan, 70°-65° 30 sec., 30 lbs.; jet, 65° 5 sec., 25 lbs.
VII	"	5,328,630	7,038	754	5,069,035	6,867	740	5,020,385	7,583	676	4,883,624	8,121	601	Hot Air, 187° 8 m.; circular, 95°-90° 45 sec., 32 lbs.; fan, 70°-65° 30 sec., 32 lbs.; jet, 65° 15 sec., 25 lbs.

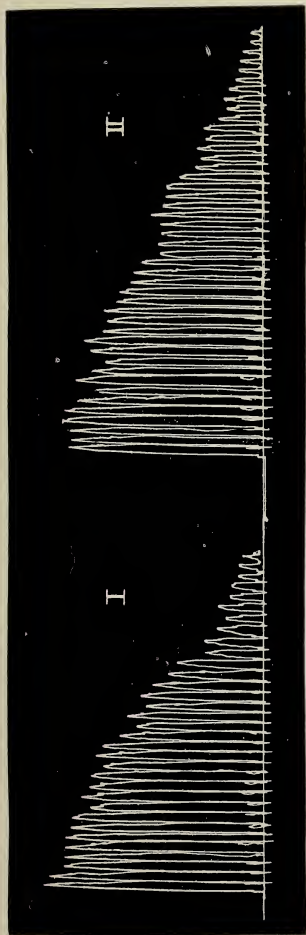
published reports show an increase of both constructive (?) and destructive metabolism. (The principals and Practice of Hydrotheraphy, by Simon Baruch, M. D.: Digest of Metabolism Experiments, by Atwater and Langworthy, 1898.) In none of these experiments was a uniform or fixed diet given. The total amount of nitrogen excreted is a measure of the metabolism of the body only when the nitrogen of the food is taken into consideration.

Observations have been made by Dr. Otto Folin, in the laboratory of the McLean Hospital, to determine whether such baths as we are giving cause any change in metabolism. Nine persons were given a uniform diet adapted to the capacity of the individual, containing a known amount of nitrogen. After this diet had been continued for two days the urine was collected for each twenty-four hours and analyzed with the results shown in the following tables. After three or four days, baths were given for about the same period of time. The results are practically negative.

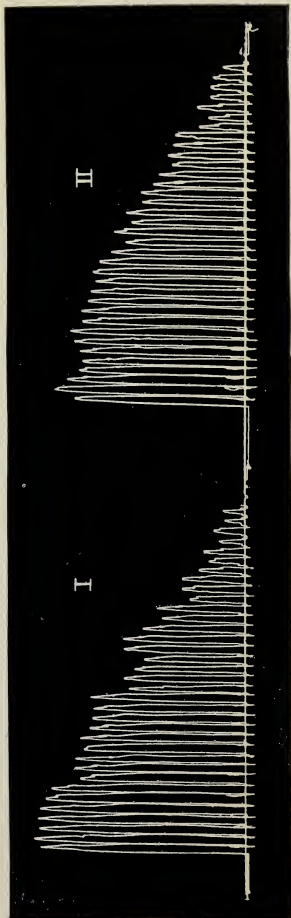
While these experiments seem to show that there is no increase of metabolism from such hydriatic procedures as we employed, they do not show that if the patient were free of the restriction of a fixed diet he would not eat more, gain in weight, and eliminate more nitrogen during the bath period. Our records show that of 216 consecutive cases who were given similar baths, 168 gained in weight and 48 lost. The gain was from $\frac{3}{4}$ to $33\frac{3}{4}$ and the loss from $\frac{1}{2}$ to $22\frac{1}{2}$ lbs. It has been noticed that the gain is usually preceded by an initial loss of a pound or two during the first week of the baths.

Cold packs have been given at temperatures between 85° and 60° with a duration of from $\frac{1}{2}$ to 2 hours. If often changed, they reduce the temperature of the body; if long continued, they raise it. They have been found exceedingly useful in cases of maniacal excitement for their soothing and even hypnotic effect.

While my observations thus far do not sustain some of the claims made for hydrotherapy, there are sufficient reasons for its use. Not the least of these is the fact that it can be adapted to the physical condition of any patient. It seems to act like exercise on the circulation, respiration, blood pressure and temperature, without active muscular exertion on the part of the

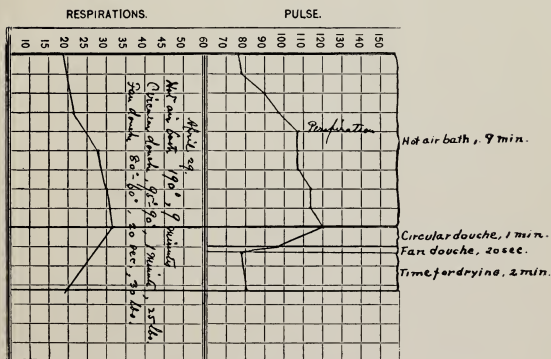
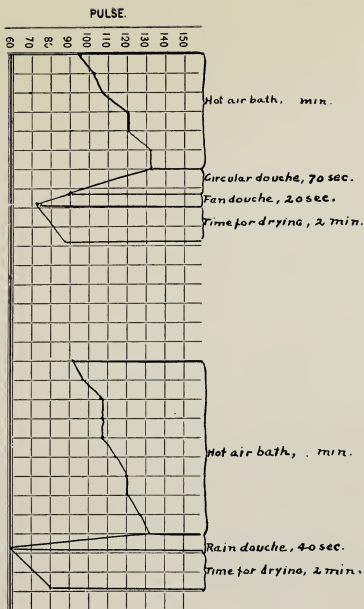


BEFORE THE BATH.



AFTER THE BATH.

EFFECT OF BATHS ON PULSE AND RESPIRATION.



EFFECT OF BATHS ON METABOLISM AS SHOWN BY ANALYSIS OF THE URINE. — Continued.

	1902.	CC. in 240.	Sp. Gr. 1.0—	Total N ₂ gms.	Total P ₂ O ₅ gms.	Total S O ₂ gms.	Ratios.				Gain or loss in Weigh't, gms.	Days of Bath.	Remarks.
							100 N ₂ :						
							P ₂ O ₅	s O ₂	100 SO ₂ :	P ₂ O ₅			
Man, 40 years.	Mch. 26	1240	17.5	11.42	1.98	1.78	17.3	15.6	111.1	111.1	+ 57	No Bath	Total water in food and drink, about 2800 cc.; total N ₂ , about 14 gm.; total fuel value in calories, about 2220.
	" 27	1500	16.	12.75	2.13	1.95	16.7	15.3	103.2	103.2	- 142	" "	
	" 28	1425	16.	12.40	1.95	1.87	15.7	15.1	104.1	104.1	+ 142	" "	
	" 28	4165		36.57	6.06	5.60							
	" 29	1340	17.	12.61	1.98	1.89	15.7	15.	104.8	104.8	+ 284	Bath	Bath :—Hot air, 174° 5 m.; circular, 95° 20 sec., 26 lbs.; fan, 85° 75° 25 sec., 29 lbs.; jet, 65° 5 sec., 50 lbs.
	" 30	1640	19.	12.95	2.21	1.85	18.	15.1	119.9	119.9	- 85	" "	
	" 31	1000	30.	11.73	2.16	1.76	18.4	15.	122.4	122.4		" "	
	" 31	3930		36.59	6.35	5.50							
	April 15	2125	20.5	20.11	3.76	3.387	18.7	16.8	110.9	110.9		No bath	Daily diet :—Tomato soup, 350 cc.; steak, 100 gm.; breast of chicken, 75 gm.; boiled ham, 50 gm.; potato, 400 gm.; bread, 175 gm.; eggs, 140 gm.; butter, 75 gm.; corn starch, 200 gm.; 1 apple; 2 bananas; milk, 900 cc.; water, 1125 cc.
	" 16	1950	21.5	18.65	3.73	3.08	20.	16.5	121.	121.		" "	Total water in food and drink about 3300 cc.; total N ₂ , about 19 gm.; total fuel value in calories, about 2803.
" 17	2060	19.5	19.99	3.70	3.17	18.	15.8	117.	117.		" "	Bath :—Hot air, 190° 0, to perspiration; circular, 98° 40° 1 m., 30 lbs.; jet, 70° 40 sec., 30 lbs.; fan, 60° 25 sec., 30 lbs.	
" 18	1450	23.	19.53	3.62	3.21	18.5	16.4	112.9	112.9	+ 907	Bath		
" 19	1360	19.	19.9	3.81	2.97	19.1	14.9	138.4	138.4		" "	Daily diet :—2 kilos* liquid food with 900 cc. water extra.	
" 20	1640	22.	20.70	3.69	3.42	17.7	16.4	103.	103.		" "		
" 20	4950		60.22	11.12	9.60								
Man, 27 years.	Dec. 13	1250	28.	19.7	4.77	3.87	24.2	19.6	123.4	123.4		No bath	
	" 14	1330	24.	19.96	4.92	3.83	24.7	19.2	128.5	128.5		" "	
	" 15	1380	22.	18.51	4.05	3.50	23.8	18.9	129.1	129.1		" "	
	" 16	1100	27.	17.98									
	" 16	5060		76.15									

* Liquid food :—500 cc. whole milk; 300 cc. Cream (18-22 % fat); 450 gm. Eggs (white and yolk); 20 gm. Sugar; 500 gm. Horlick's Malted Milk; 6 gm. Salt (75 cc., of a 10 % vol.); water enough to make 2 liters. This contains about 19 gm. N₂, 5.75 gm. P₂O₅ and 3.70 gms. S O₂.

EFFECT OF BATHS ON METABOLISM AS SHOWN BY ANALYSIS OF THE URINE. — *Continued.*

	1902.	CC. in 24 ^h .	Sp. Gr. 1.0—	Total N ₂ gms.	Total P ₂ O ₅ gms.	Total S O ₃ gms.	Ratios.				Gain or loss in Weight, gms.	Days of Bath.	Remarks.
							100 N ₂ :						
							P ₂ O ₅	S O ₃	100 SO ₃ :	P ₂ O ₅			
Man, 37 years.	Dec. 17	1350	24.	18.26	4.59	3.55	25.1	19.4		129.		Bath	Bath:—Hot air, 190°, 5 minutes; circular, 98°-100°, 45 sec., 25 lbs.; fan, 65°, 15 sec., 25 lbs.; jet, 75°, 10 sec., 25 lbs.
	" 18	1325	25.	17.88	4.57	3.43	35.5	19.2		133.		"	
	" 19	1050	20.	18.02	4.14	3.58	29.9	19.8		116.		"	
	" 20	1040	27.	17.71	4.12	3.18	24.2	18.7		129.		"	
	1903. Jan. 9	1700	16.	15.18	3.06	2.97	20.2	19.6		103.3		No bath	Daily diet:—2 kilos liquid food with 900 cc. water extra.
	" 10	890	30.	14.8	3.42	3.11	23.1	20.1		110.	-40	"	
	" 11	1405	19.	16.5	3.79	2.98	24.5	18.9		137.	-180	"	
	" 12	1185	25.	15.6	3.74	3.24	34.	20.8		115.	-140	"	
	" 13	1425	19.	15.6	3.79	3.12	24.3	20.		121.4	+160	"	
	" 14	1110	24.	16.4	3.46	3.29	21.1	20.		105.	+400	"	
	" 15	3670	47.6	10.99	9.65	9.65							
	" 16	1400	20.	16.13	3.86	3.23	23.9	20.		119.	-300	Bath	Bath:—Circular, 97°-90°, 1 m., 30 lbs.; fan, 66°, 15 sec., 30 lbs.; jet, 70° 15 sec., 30 lbs.
	" 17	1450	23.	16.61	3.86	3.11	23.2	18.7		124.	-100	"	
	" 18	1660	17.	16.92	3.75	3.39	22.2	20.		110.6	+200	"	
	" 19	4510	49.66	11.47	9.73	9.73							
" 20	935	26.	15.42	3.74	3.18	24.2	20.6		118.	+200	No bath	Daily diet:—2 kilos liquid food with 900 cc. water extra.	
" 19	1570	19.	16.43	3.71	3.11	22.5	18.8		119.	-40	"		
" 20	1125	22.	14.87	3.95	3.07	26.5	20.6		128.7	+240	"		
" 21	3650	46.77	11.40	9.36	9.36								
Jan. 26	1025	24.	14.81	3.88	2.81	22.2	19.		117.		No bath		
" 27	1545	16.	14.22	3.43	2.72	24.1	19.1		126.		"		
" 28	2370	23.	22.03	6.81	5.53						"		
" 29	1975	16.	16.22	4.16	3.17	25.6	19.5		131.	+780	"	Bath:—Hot air, 190°, 5 m.; circular, 98°-100°, 45 sec., 25 lbs.; fan, 70° 15 sec., 25 lbs.; jet, 80°, 10 sec., 25 lbs.	
" 30	1600	23.	16.88	3.64	3.24	21.6	19.2		112.	-225	"		
" 31	2375	33.10	7.80	6.41	6.41								
" 32	1100	25.	16.54	3.74	2.93	22.6	17.7		127.	+450	Bath		
" 31	1450	18.	15.83	3.83	3.10	24.2	19.6		124.				
" 32	2550	32.37	7.57	6.03	6.03								

EFFECT OF BATHS ON METABOLISM AS SHOWN BY ANALYSIS OF THE URINE.—Continued.

	1903.	CC. In 24 ^h .	Sp. Gr. 1.0—	Total N ₂ gms.	Total P ₂ O ₅ gms.	Total S O ₂ gms.	Ratios.			Gain or loss in Weight, gms.	Days of Bath.	Remarks.
							100 N ₂ :					
							P ₂ O ₅	S O ₂	100 S O ₂ :			
Man, 57 years.	Jan. 27	1550	20.	16.76	3.94	3.13	23.4	18.7	136.	- 60 + 250	No bath " " " "	Daily diet:—2 kilos liquid food with 900 cc. water extra.
	" 28	1325	19.	15.98	3.71	3.12	23.2	19.5	119.			
	" 29	1475	19.	15.93	3.83	3.12	24.1	19.6	122.7			
	" 29	4350	19.	48.67	11.48	9.37	24.1	19.6	122.7			
" "	" 30	1550	20.	16.49	3.89	3.03	23.5	18.7	136.	- 170 - 170 + 60	Bath " " " "	Bath :—Circular, 98°-90° 45 sec., 20 lbs.; fan, 70° 15 sec., 20 lbs.; jet, 85°, 10 sec., 20 lbs.
	" 31	1480	20.5	16.68	3.91	3.18	23.5	19.	123.			
	Feb. 1	1375	20.	15.82	3.69	3.20	23.3	20.2	115.			
		4435	20.	43.99	11.49	9.46	23.3	20.2	115.			
Woman, 41 years.	" 7	1625	14.	10.42	2.54	2.08	24.4	20.	152.	No bath " " " "	No bath " " " "	Daily diet :—1333 gms. liquid food with 500 cc. water extra.
	" 8	950	24.5	10.15	2.39	2.07	23.5	20.4	115.			
	" 9	1650	14.	10.42	2.26	2.03	21.7	19.5	111.			
	" 9	4195	14.	30.99	7.19	6.13	21.7	19.5	111.			
" "	" 10	1220	16.	10.05	2.05	2.25	20.5	22.4	91.6	+ 200 - 400 + 300	Bath " " " "	Bath :—Hot air, 150°, 5 m.; cir- cular, 90°, 20 sec., 18 lbs.; fan, 85° 50°, 20 sec., 30 lbs.
	" 11	1215	18.	10.92	2.43	2.15	22.2	19.7	113.			
	" 12	920	19.5	9.92	2.80	2.08	23.2	21.	110.			
	" 12	3365	19.5	30.89	6.79	6.48	23.2	21.	110.			
Man, 60 years.	" 18	1975	18.	16.3	3.95	3.22	24.2	19.8	122.	+ 200 - 400 + 300	No bath " " " "	Daily diet :—2 kilos liquid food with 500 cc. water extra.
	" 19	1500	20.	14.07	3.60	2.85	25.6	20.2	126.			
	" 20	1610	18.	14.11	3.66	2.77	27.3	19.6	140.			
	" 20	5585	18.	44.46	11.41	8.64	27.3	19.6	140.			
" "	" 21	1525	18.5	13.87	3.81	2.80	27.6	20.3	136.	+ 100 + 400 + 400	" " " " " "	Bath :—Hot air, 190°, 4 m.; circu- lar, 98°-90°, 45 sec., 20 lbs.; fan, 85° 75°, 20 sec., 20 lbs.
	" 22	1625	18.5	16.41	4.14	3.03	25.2	19.	134.			
	" 23	1325	24.	15.68	4.04	2.80	25.9	18.4	140.			
	" 23	4475	24.	45.96	11.89	8.77	25.9	18.4	140.			
" "	" 24	1800	19.	16.75	4.16	3.24	24.9	20.	125.	+ 200 - 400 + 160	Bath " " " "	Bath :—Hot air, 190°, 4 m.; circu- lar, 98°-90°, 45 sec., 20 lbs.; fan, 85° 75°, 20 sec., 20 lbs.
	" 25	1975	17.	14.48	3.79	2.93	26.2	20.2	129.			
	" 26	1825	18.5	15.70	4.07	3.16	26.	20.1	128.			
	" 26	5590	18.5	46.93	12.02	9.43	26.	20.1	128.			

patient. There probably is also a more permanent secondary effect on the blood-vessels as is shown by a quicker and more perfect reaction with continued use of the baths.

Theoretically there should be an effect on the internal organs in the way of increase of activity from periodical flushing. This may be so, though the metabolism experiments reported by me do not show it.

The effect of these baths on the mind of the patient should not be overlooked. He has not the slightest doubt that something is being done for him. No one ever told me that the baths had no effect, while complaints of their severity have not been uncommon. Patients always speak of them respectfully. A former patient with the delusion of demoniacal possession, who had improved while taking baths, wrote me: "Your baths are excellent to reduce cerebral excitement. You can't fight the *dévil* with fire,—he is in his element there,—but he is mortally afraid of cold water."

It is something for the melancholy patient to go to the gymnasium daily for a bath and gentle exercise, with the idea thus kept prominent that he is sick and that efforts are being made for his recovery. Far better is the morning spent in this way than in sitting about the ward, lamenting his terrible condition or brooding over imaginary woes.

We have given baths to all forms of mental diseases; many who have taken them have recovered, but they were all of the forms of diseases generally recognized as recoverable.

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